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ON BALLS OF VEGETABLE MATTER FROM SANDY SHORES.

(Second Article).

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In this Journal for March, 1905 (**7**, 41–47), I gave such data as I had been able to collect concerning the occurrence, composition and mode of formation of those somewhat interesting, even though not very important, objects described by the title to this paper. Since that article was published some additional facts have come to my knowledge, and are presented herewith.

In the first place, even before the publication of the former article, Professor Farlow, in response to a question of mine, had written me that such balls occur on the French shores of the Mediterranean. But for some reason or other, probably because his communication happened to fall upon the blind spot which our intellects as well as our eyes seem to possess, I did not understand that these marine balls are homologous in origin with the kind I was describing from freshwater lakes, and accordingly I failed to include them with the latter. But since then I have been able, by aid of notes kindly sent me by Professor Farlow and by Mr. F. S. Collins, to trace out the subject with some completeness, with results which, in so far as they concern our present subject, are as follows. Balls of vegetable matter formed by action of the waves upon sandy shores, both of lakes and the sea, are known in Europe, and from early times have been called *Aegagropila* by naturalists. The best known of these balls are those found on the French shores of the Mediterranean, where they are known as *Aegagropiles de mer*, or *Aegagropiles marines*, or *Pelotes marines*.

Under the supposition that all such balls were of similar origin and of algal nature, they were included in an algal genus *Aegagropila*, which comprised also some fresh-water confervoid Algae of a radiating-globular mode of growth. The real nature of the *Aegagropiles marines* was apparently first pointed out in print by Weddell in 1879. He showed that they are not Algae at all, but principally the fringed-out and balled up fibrovascular bundles of *Posidonia Caulini*, a naiadaceous phanerogam (*Actes du Congrès international de botanistes, d'horticulteurs, de négociants et de fabricants de produits du règne végétal, tenu à Amsterdam, en 1879*, 58–61; as abstracted in *Just's Jahresbericht*, **9**, 1879, 333). But Professor Farlow tells me that their real nature was understood before this, for in 1872 he collected specimens at Antibes, France (one of which is now in the Botanical Museum of Harvard University), and their formation from *Posidonia* was then known to the botanists of that place. A different explanation of the materials of which they are mainly composed was given in 1892 by W. Russell, who stated that they consist chiefly of the remains of pine cones (*Revue générale de Botanique*, **4**, 1892, 545). This conclusion was denied by Sauvageau, who again pointed out their composition from *Posidonia* bundles (*Journal de Botanique*, **7**, 1893, 34, 95). In the meantime, however, Russell had published a second article, repeating his statement about the pine cones, and giving a classification of the various materials composing such balls, both from fresh and from salt water, so far as known to him. He finds that, in addition to the pine-cone kind, some do consist of *Posidonia* with or without Algae and sponge remains, some of *Zostera*, some (in English lakes) of larch cones, some (in the lakes of the Engadine) of fir cones and fir needles, some (in the Lake of Geneva) of wood shavings. (*Revue générale de Botanique*, **5**, 1893, 65, as abstracted in *Beihefte zum botanischen Centralblatt*, **3**, 1893, 444). This list, by the way, has much interest in connection with that given for American balls in my first article. Russell was in error as to the pine cones, and the *Aegagropiles marines* are now universally known to consist mainly of *Posidonia*, and they are thus described under that genus in Engler and Prantl's *Die natürlichen Pflanzenfamilien*, II, 1, 207. The distinction between the algal and the "kunstliche" Aegagrophila is also well brought out by G. de Lagerheim in *Nova Notisaria* 1892, Ser. III, 89.

But other marine balls, of very different materials, have recently been reported from another direction. Under the title "Water-Rolled

Weed-Balls," Dr. A. H. MacKay describes fully, with photo-illustrations, some typical balls from the coast of Nova Soctia, and finds them composed of Algae, mainly *Dictyosiphon*, *Desmarestia*, *Ectocarpus*, *Chordaria*, and *Chorda*, with some other accessory materials (*Proceedings and Transactions of the Nova Scotian Institute of Science*, **11**, part 4, 1908, 667). Professor Farlow writes me that such balls occur also on the coast of New England.

I find also, by the way, that in the former article I did not do justice to one of the references given by J. Adams in *Science* (**19**, 1904, 926); for his note clearly points to the occurrence of the balls in a lake of the Hebrides. Another, material unstated, is reported from a Nova Scotia lake by Dr. MacKay in the article above cited. And Professor Barrows, in the letter next to be quoted, mentions the occurrence of balls composed of tamarack leaves, in a lake in Oakland County, Michigan.

Finally another, and very different, composition for balls of exactly similar mode of formation has been communicated to me by Professor Walter B. Barrows of the Michigan Agricultural College, along with several specimens. The balls are composed almost wholly of hair, and their origin is thus described in Professor Barrows' letter (of Oct. 7, 1908).

The hair comes from a tannery located on the shore of Lake Michigan, a mile or two north of Petoskey, at a point called Kegomic, and these hair balls are cast up on the beach about a mile further along, although a few are found at other places around the bay. This beach forms the easternmost point of Little Traverse Bay and receives the full force of the westerly and southwesterly winds, so that there is often a rather heavy surf on the beach. The hair balls are of all sizes up to at least five inches in diameter, although my recollection is that balls of that size are much less common than smaller ones. The shape also is quite variable but there seems to be a marked tendency towards elliptical outlines, so that the smaller ones often resemble cocoons quite closely. I am told by people living at Harbor Springs and at Petoskey that these hair balls have been a constant feature of the beach for fifteen or twenty years past, and presumably ever since the tannery was started.

The wave-formed balls, therefore, occur in the sea as well as the lakes of fresh water, and they are made up of the most diverse materials. The one feature they have in common is their mode of formation, which depends upon the rolling action of the submersed parts of waves working upon fibrous substances resting lightly upon sandy bottoms.

They are, of course, of all degrees of perfection, from loose aggregations of miscellaneous materials, familiar enough on all beaches and attracting no notice, up to those perfectly rounded forms whose symmetry and smoothness of outline compel attention and demand explanation; and it is these more perfect forms which are the subject of these two articles. Probably they occur, in suitable places, all over the globe, and, after all, the most curious thing about them is the fact that they are seemingly so little known, and so rarely mentioned, in botanical literature.

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A COLOR FORM OF POTENTILLA PUMILA.

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THERE is a place in the outskirts of Cambridge which, partly because of its interesting indigenous plants and partly because of certain dumping grounds in its vicinity, well repays the botanist for an occasional inspection. In the course of a recent visit to this spot, Professor Fernald and the writer noticed a peculiar and very pretty *Potentilla*, which, on examination, proved to be a form of *P. pumila* Poir. with cream-colored petals. There were forty or fifty vigorous plants of it, chiefly in a dense central colony, but with outlying individuals scattered over a space some fifty feet in diameter. With their pale petals, they contrasted strongly with the typical *Potentilla pumila* which grew abundantly about and intermingled with them. No intergradients between the two forms were observed.

The pale-flowered plant differs from typical material of *P. pumila* only in the color of its petals. It apparently represents a variation analogous to the color forms of *Gratiola aurea* recently described by Mr. H. H. Bartlett in RHODORA [**9**: 122]. No white-flowered *Potentilla pumila* to correspond with Mr. Bartlett's forma *leucantha* has, indeed, been recorded, so far as the present writer is aware; but the color-relation between typical *P. pumila* and its pale-flowered variant and that between *Gratiola aurea* and its forma *helveola* are rather strikingly similar.